

FERNS AND FERN ALLIES OF MISSOURI¹

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This paper is based primarily upon material in the herbarium of the Missouri Botanical Garden, the University of Missouri, and the private collections of Mr. John H. Kellogg and of the author. After each specific name reference is given to the original publication; this is followed by reference to the two standard manuals and to an illustrated monograph covering the fern-flora of the region concerned, where the species or variety is treated under the same or a different name. These are: Gray, 'New Manual of Botany,' ed. 7, 1908; Britton and Brown, 'Illustrated Flora of the Northern States and Canada,' ed. 1, 1896, and ed. 2, 1913; and Eaton, 'Ferns of North America,' vol. 1, 1879 (*plates 1-45*) and vol. 2, 1880 (*plates 46-81*). Time of fruiting, the general distribution for North America, and the habitat for Missouri in particular precede the specific description. The names of the principal collectors whose material was examined are listed, and definite citations made when the plant is rare.

KEY TO FAMILIES

1. Plants with short vertical stems or rootstocks.....2
1. Plants with horizontally spreading stems or rootstocks.....4
2. Leaves onion-like, producing sporangia at their bases.....*Isoetaceae*
2. Leaves neither onion-like nor producing sporangia at their bases.....3
3. Sporangia borne on under sides of leaves.....*Polypodiaceae*
3. Sporangia borne terminally in special fruiting clusters.....*Ophioglossaceae*
4. Sterile leaves large, usually compound or variously divided.....5
4. Sterile leaves small, often scale-like.....6
5. Fertile segments leaf-like or pod-like; if the latter, sporangia covered with
indusia.....*Polypodiaceae*
5. Fertile segments not leaf-like; sporangia naked.....*Osmundaceae*
6. Plants truly aquatic.....*Salviniaceae*
6. Plants terrestrial.....7
7. Stems jointed; sporangia clustered underneath the scales of terminal cone-
like spikes.....*Equisetaceae*
7. Stems not jointed; sporangia borne on upper surfaces of leaves.....8

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8. Spores all of the same kind.....*Lycopodiaceae*
 8. Spores of two kinds (larger macrospores and much smaller microspores).....
*Selaginellaceae*

OPHIOGLOSSACEAE

1. Veins free; sporangia separate in compound inflorescences.....*Botrychium*
 1. Veins reticulate; sporangia disposed in a solitary spike.....*Ophioglossum*



Fig. 1. Key map to distribution chart (fig. 2) showing location of counties in Missouri.

OPHIOGLOSSUM

1. Sterile segments obtuse, usually solitary; middle areoles long and narrow, outer hexagonal and containing a few included veinlets.....1. *O. vulgatum*
 1. Sterile segments cuspidate, 2-5; areoles wide and containing many anastomosing veinlets.....2. *O. Engelmanni*

1. *Ophioglossum vulgatum* L. Sp. Pl. 2: 1062. 1753. Gray, p. 47; Britton & Brown, ed. 1 and 2, 1: 2.

Rootstock short, oblique or erect; common stalk half or more above ground, constituting $\frac{1}{3}$ to $\frac{2}{5}$ the length of the plant; sterile segments sessile, ovate, 1–5 inches long, 0.5–2 inches broad; basal veins about 9; sporophyll 0.75–2 inches long, apiculate. May to August.

Distribution: Nova Scotia to Delaware, westward to Missouri and Texas. South-eastern Missouri—swamps or moist meadows.

Specimens examined: *Palmer 14716, 14732, 14748, 14765.*

2. Ophioglossum Engelmanni Prantl in Ber. Deut. Bot. Ges. 1: 351. 1883. Gray, p. 47; Britton & Brown, ed. 1 and 2, 1: 2.

Rootstock cylindrical; common stalk mostly below ground, sheathed by persistent leaf-bases; sterile segments sessile, elliptic to ovate, 1–3.5 inches long, 0.5–2 inches broad; basal veins 13 or more, transverse ones oblique; sporophyll 0.5–1 inch long, apiculate. March to October.

Distribution: South Carolina to Florida, westward to Arizona. Limestone glades, especially where there is a thin layer of fine rich and damp soil.

Specimens examined: *Palmer, Kellogg, Letterman, Engelmann, Bush, Pinkerton, Eggert, Greenman.*

BOTRYCHIUM

1. Bud wholly enclosed; cells of epidermis straight; sterile blade petiolate and never over 7 inches broad; common stalk mostly underground 2
1. Bud exposed along one side at base of rootstock; cells of epidermis flexuous; sterile blade sessile, 2–16 inches broad and nearly as long; common stalk above ground, half the length of plant 4
2. Ultimate segments deeply lacinate 2. *B. obliquum* var. *dissectum*
2. Ultimate segments serrulate-dentate 3
3. Plant coarse; common stalk very short, underground; frond membranaceous on drying 1. *B. obliquum*
3. Plant slender; common stalk up to 2 inches above ground; frond coriaceous on drying 3. *B. obliquum* var. *tenuifolium*
4. Ultimate segments spatulate-shaped; ripe sporangia straw-colored, opening but slightly in dehiscence 5. *B. virginianum* var. *intermedium*
4. Ultimate segments acute; ripe sporangia brown, opening widely in dehiscence. 4. *B. virginianum*

1. Botrychium obliquum Mühl. in Willd. Sp. Pl. 5: 63. 1810. Gray, p. 48; Britton & Brown, ed. 1, 1: 3, ed. 2, 1: 5; Eaton, *pl. 20, fig. 2.*

B. ternatum Sw. in Schrad. Jour. für die Bot. 2 (1800): 111. 1801.

B. ternatum var. *obliquum* D. C. Eaton, Ferns N. Am. 1: 149. 1879.

Plant 5–15 inches tall; bud pilose; sterile blade long-stalked, 2–5 inches broad, tripinnatifid or tripinnate below; ultimate segments obliquely ovate or oblong-lanceolate, acutish terminal ones elongate; sporophyll long-stalked, usually stout, several-pinnate. August to October.

Distribution: Maine to Alabama, westward to Michigan and Texas. Moist woods, neutral soil.

Specimens examined: *Palmer, Bush, Kellogg, Letterman, Eggert, Trelease.*

2. *Botrychium obliquum* var. *dissectum* Prantl in K. Bot. Gard. Berlin, Jahrb. 3: 342. 1884. Gray, p. 49; Britton & Brown, ed. 1, 1: 3, ed. 2, 1: 5; Eaton, *pl. 20, fig. 1.*

B. dissectum Spreng. Anleit. 3: 172. 1804.

B. ternatum var. *dissectum* D. C. Eaton, Ferns N. Am. 1: 150. 1879.

Character of rootstock, fruiting stalks, and texture of the plant all similar to the species; frond subternately divided, basal divisions unequally and broadly deltoid, decomposed; the upper and secondary pinnae deltoid-lanceolate, pinnate, with lacinate or deeply cut pinnules; the ultimate divisions divergent, narrow, and incised.

Distribution: Maine to Florida, westward to Illinois and Missouri. Rich moist woods, deeply shaded.

Specimens examined: *Eggert, Letterman, Pinkerton.*

3. *Botrychium obliquum* var. *tenuifolium* (Underw.) Gilbert in Fern Bull. 11: 99. 1903. Gray, p. 49. Pl. 5, fig. 2.

Plant small, up to 12 inches high; common stalk up to 2 inches high, not all underground, slender; blade ternate with few divisions, 5–10 cm. broad and about 5 cm. long; leaves coriaceous; ultimate segments broad, about 1.5 cm. long, ovate, acutish, conspicuously serrulate. September and October.

Distribution: Virginia to Arkansas. Southern Missouri—swampy land.

Specimens examined: Dunklin Co., *Bush 134*, and coll. of Sept. 28 and Oct. 28, 1897, *Trelease*; Butler Co., *Bush 3110*.

4. *Botrychium virginianum* (L.) Sw. in Schrad. Jour. für die Bot. 2 (1800): 111. 1801. Gray, p. 49; Britton & Brown, ed. 1, 1: 4, ed. 2, 1: 6; Eaton, *pl. 33.*

Common stalk slender, above ground $1/2$ – $2/3$ the length of

plant; blade sessile or nearly so, membranaceous, ultimate segments toothed; sporophyll long-stalked, bi-tripinnate. June and July.

Distribution: New Brunswick to Alabama, westward to Idaho and Texas. Rich moist woods.

Specimens examined: *Davis, Engelmann, Letterman, Palmer, Bush, Pinkerton, Eggert, Kellogg, Trelease, Larsen, Daniels, Emig, Blankenship.*

5. *Botrychium virginianum* var. *intermedium* Butters in *Rhodora* 19: 207. 1917.

Ultimate segments of the sterile frond spatulate, penultimate ones ovate, not crowded; segments of the fertile frond opening wide in dehiscence; sporangia straw-colored, up to 0.8 mm. long.

Specimens examined: Monteer, Shannon Co., *Bush 4724*; Whiteside, Lincoln Co., *Davis*, coll. of 1910. The writer feels that the species is so generally variable that this variety is not very distinct.

POLYPODIACEAE

- | | |
|--|---------------------|
| 1. Indusia lacking | 2 |
| 1. Indusia present, at least in early stages | 4 |
| 2. Fruit dots near margin, becoming confluent, somewhat protected by overlapping leaf margins; lower surfaces of leaves covered with a white powder. | <i>Notholaena</i> |
| 2. Fruit dots separate, round, absolutely unprotected | 3 |
| 3. Fronds linear, once-pinnatifid | <i>Polypodium</i> |
| 3. Fronds triangular, more than once-pinnatifid | <i>Thelypteris</i> |
| 4. Fronds dimorphic (fertile fronds not leaf-like) | 5 |
| 4. Fronds monomorphic | 6 |
| 5. Sterile fronds pinnatifid; veins anastomosed; fertile segments bipinnate | <i>Onoclea</i> |
| 5. Sterile fronds bipinnatifid; veins free and unbranched; fertile segments pinnate | <i>Pteretis</i> |
| 6. Indusia marginal | 7 |
| 6. Indusia not marginal | 11 |
| 7. Indusia not formed of revolute margins, but cup-shaped and opening terminally | <i>Dennstaedtia</i> |
| 7. Indusia formed in part at least by revolute margins | 8 |
| 8. Indusia definitely interrupted, occurring in separate little rounded flaps | <i>Adiantum</i> |
| 8. Indusia continuous or only slightly broken | 9 |
| 9. Indusia double | <i>Pteridium</i> |
| 9. Indusia single | 10 |
| 10. Blades with a few large, relatively smooth segments | <i>Pellaea</i> |
| 10. Blades with many small, usually tomentose or hairy segments | <i>Cheilanthes</i> |
| 11. Sori elongated | 12 |
| 11. Sori rounded | 15 |
| 12. Sori dispersed in two rows parallel to the midrib | <i>Woodwardia</i> |

12. Sori dispersed irregularly on lateral veins.....13
 13. Veins anastomosed.....*Camptosorus*
 13. Veins free.....14
 14. Sori straight.....*Asplenium*
 14. Sori mostly curved over the end of veins.....*Athyrium*
 15. Indusia peltate.....16
 15. Indusia attached at base or at one side.....17
 16. Indusia orbicular, attached centrally.....*Polystichum*
 16. Indusia reniform, attached at sinus.....*Thelypteris*
 17. Plants never glandular, but scaly on stipes and rootstocks; segments more or less acute; indusia tapering, attached at one side and becoming obscure at maturity.....*Cystopteris*
 17. Plants glandular, also scaly; segments obtuse; indusia entire when young, splitting at top into several stellate segments.....*Woodsia*

ADIANTUM

1. Main rachis unbranched.....1. *A. Capillus-Veneris*
 1. Main rachis dichotomously branched with 4-5 pinnae on each side..2. *A. pedatum*

1. *Adiantum Capillus-Veneris* L. Sp. Pl. 2: 1096. 1753. Gray, p. 36; Britton & Brown, ed. 1, 1: 27, ed. 2, 2: 31; Eaton, *pl. 37*. Venus hair.

Rootstock creeping, chaffy; stipe very slender, 3-12 inches long, black or brownish, slightly scaly; frond ovate-lanceolate, 6-12 inches long, 4-12 inches wide at base; pinnules wedge-obovate or rhomboid, long-stalked, glabrous, membranaceous, margins variously incised, veinlets flabellately forking from base; fruit dots lunate or transversely oblong. June to August.

Distribution: New Jersey to Florida, westward to South Dakota and California. Moist rocky places, ravines, wet limestone cliffs.

Specimens examined: Kellogg, Daniels, Bush, Palmer, Trelease, Emig, Shepard.

2. *Adiantum pedatum* L. Sp. Pl. 2: 1095. 1753. Gray, p. 35; Britton & Brown, ed. 1, 1: 27, ed. 2, 2: 31; Eaton, *pl. 18*. Maidenhair.

Rootstock long, creeping, chaffy; stipe 9-18 inches long, shining, dark brown to black, slightly scaly at base, once-forked at summit, each division bearing on one side only several pinnate divisions (occasionally tri-forked); blade reniform-orbicular, 8-18 inches broad, membranaceous, glabrous; pinnules short-stalked, oblong, triangular or end ones fan-shaped; lower margin entire, all veins proceeding from it, upper margin lobed. June to August.

Distribution: Nova Scotia and Quebec to Georgia, westward to Alaska and California. Moist rich woods.

Specimens examined: *Bush, Davis, Engelmann, Palmer, Trelease, Pinkerton, Woodson, Kellogg, Broadhead, Emig, Mackenzie.*

ASPLENIUM

1. Blades pinnatifid, or only lower segments pinnate; apices long-attenuate. 2
1. Blades 1-3-pinnate; apices not long-attenuate. 3
2. Blades membranaceous; lower midribs black and shining on under side; apices crenate, sometimes proliferous. 3. *A. ebenoides*
2. Blades subcoriaceous; midribs green, herbaceous; prolongations sinuous-margined, not proliferous. 4. *A. pinnatifidum*
3. Blades 1-pinnate only; pinnae of regular shape; margins not deeply dissected. 4
3. Blades 2-3-pinnate or -pinnatifid; pinnae of irregular shape; margins deeply cut. 6
4. Pinnae mostly roundish, not auriculate. 7. *A. Trichomanes*
4. Pinnae oblong or lanceolate, auriculate. 5
5. Stipes and rachises shiny black, slender; pinnae mostly opposite; sori few and nearer margins than costae. 6. *A. resiliens*
5. Stipes and rachises shiny reddish brown, coarse; pinnae mostly alternate; sori numerous, near costae. 5. *A. platyneuron*
6. Stipes and rachises green throughout; ultimate segments few, cuneate; margins fimbriate. 2. *A. cryptolepis*
6. Stipes and rachises shining chestnut-brown; lower pinnae divided into obtuse segments; margins crenate. 1. *A. Bradleyi*

1. **Asplenium Bradleyi** D. C. Eaton, Bull. Torr. Bot. Club 4: 11. 1873. Gray, p. 39; Britton & Brown, ed. 1, 1: 26, ed. 2, 1: 30; Eaton, *pl. 51, figs, 4-8.*

Rootstock short, covered with narrow acuminate blackish-fuscous scales; fronds 4-7 inches high, oblong-lanceolate; stipes 2-3.5 inches long, dark chestnut and shining, tufted, slender; rachises brown, or green above; pinnae numerous, lower ones no larger than the middle ones, obtuse or acutish, toothed, in the largest fronds pinnatifid into oblong lobes which are toothed at apices; sori short, borne near midveins, becoming confluent; indusia membranaceous, persistent. July to September.

Distribution: New York to Georgia, westward to Missouri and Arkansas. On sandstone or chert outcrops—comparatively rare and local.

Specimens examined: *Palmer, Bush, Trelease, Mackenzie, Greene, Pinkerton, Van Dugen, Shepard.*

2. **Asplenium cryptolepis** (L.) Fernald in *Rhodora* 30: 37.

1928. Gray, p. 39; Britton & Brown, ed. 1, 1: 25, ed. 2, 1: 29; Eaton, *pl. 15, fig. 1*.

Asplenium Ruta-muraria L. Sp. Pl. 2: 1081. 1753.

Rootstock short, creeping, entangled, tufted; fronds 1–6 inches tall; stipes and rachises entirely green or slightly brown at base; blades deltoid-ovate, smooth, subcoriaceous, bi-tripinnate; ultimate segments few, stalked, 3–14 mm. long, narrowly cuneate to roundish obovate; margins deeply fimbriate; veins flabellate, no midveins; sori few (2–4 per pinna), oblong, covering whole segment when mature; indusia delicate with ciliated margin. July to September.

Distribution: Vermont to Georgia, westward to Illinois and Missouri. Shaded limestone cliffs—scarce.

Specimens examined: *Trelease, Palmer, Bush, Russell*.

3. *Asplenium ebenoides* R. R. Scott, Berkeley in Roy. Hort. Soc. Jour. N. S. 1: 137. 1866. Gray, p. 38; Britton & Brown, ed. 1, 1: 23, ed. 2, 1: 26; Eaton, *pl. 4, fig. 2*.

Rootstock short, creeping, chaffy; fronds up to a foot high; stipes tufted, 4–9 inches long, young ones reddish brown, older ones black, shining, slender; lower rachises dark and shining underneath; blades firm-membranaceous, triangular-lanceolate, variable, 3–12 inches long, 1–3 inches at base, tapering to a long-acuminate apex which may become proliferous, lowest divisions distinct, shorter; sori numerous throughout, mostly single and opening obliquely upwards. August and September.

Distribution: Vermont to Alabama, westward to Missouri. Limestone—rare.

Specimens examined: *Trelease, Russell*.

4. *Asplenium pinnatifidum* Nutt. Gen. 2: 251. 1818. Gray, p. 38; Britton & Brown, ed. 1, 1: 22, ed. 2, 1: 27; Eaton, *pl. 8, fig. 2*.

Rootstock short, creeping, branched, chaffy; fronds 6–9 inches high; stipes brownish near base and green above, clustered; blades 2–5 inches long, subcoriaceous, herbaceous, lanceolate-acuminate from broad and sub-hastate base, pinnatifid; the basal pinnae sometimes long-attenuate, lower lobes of pinnae roundish-ovate, margin crenate, upper pinnae gradually smaller and more adnate to winged rachises; sori straight, many, be-

coming confluent with age, mostly solitary, occurring also on the slender prolongation. July to October.

Distribution: Massachusetts to Alabama, westward to Missouri; recorded from Georgia and Arkansas. On La Motte sandstone only, in shaded crevices of cliffs.

Specimens examined: *Trelease, Engelmann, Russell, Pinkerton.*

5. *Asplenium platyneuron*² (L.) Oakes in D. C. Eaton, *Ferns N. Am.* 1: 24. 1879. Gray, p. 39; Britton & Brown, ed. 1, 1: 23, ed. 2, 1: 27; Eaton, *pl. 4, fig. 1.* Ebony spleenwort.

Asplenium ebeneum Ait. Hort. Kew. 3: 462. 1789.

Fronds 4–20 inches high, fertile ones tall and upright, sterile ones short and spreading; stipes and rachises reddish brown, shining, rather thick; blades linear-oblongate, tapering at base, once-pinnate; pinnae 20–40 pairs, lanceolate, 0.5–1.5 inches long, alternate, sessile, auricled on upper or both sides of base, and more or less overlapping rachis; sori 8–15 in number, nearer midveins than margins, becoming confluent. July to September.

Distribution: Vermont to Alabama, westward to Texas and Oklahoma; recorded from Ontario and Colorado. Rocky open woods, preferring alkaline soil.

Specimens examined: *Davis, Kellogg, Engelmann, Eggert, Trelease, Bush, Palmer, Daniels, Pinkerton, Woodson, Russell, Mann, Dewart, Emig, Krause, Meek.*

6. *Asplenium resiliens* Kunze, *Linnaea* 18: 331. 1844. Gray, p. 39; Britton & Brown, ed. 1, 1: 23, ed. 2, 1: 27; Eaton, *pl. 36, figs. 5 & 6.*

Asplenium parvulum Mart. & Gal. in *Mém. Acad. Brux.* 15: 60. 1842.

Rootstocks with black scales; fronds 4–12.5 inches long; stipes and rachises black and shining, slender; blades normally linear-oblongate, pinnate; pinnae 4–12 mm. long, mostly opposite, nearly sessile, upper edges auricled and on lower pinnae both edges auricled, deflexed; blades widest in middle; margins mostly entire or slightly crenate, tendency to incurve slightly; fruit dots nearer outer margins than midribs, nearly parallel to the midribs, oblong, few, sometimes becoming confluent. June to October.

² Var. *incisum* (E. C. Howe) Robinson in *Rhodora* 10: 29. 1908, has very brittle stipes and the pinnae deeply pinnatifid. This appears to be merely an ecological variation.

Distribution: Massachusetts to Florida, westward to New Mexico. Limestone cliffs.

Specimens examined: *Trelease, Bush, Palmer, Russell, Pinkerton, Drouet.*

7. *Asplenium Trichomanes* L. Sp. Pl. 2: 1080. 1753. Gray, p. 39; Britton & Brown, ed. 1, 1: 24, ed. 2, 1: 28; Eaton, *pl. 36, fig. 1.* Maidenhair spleenwort.

Rootstocks nearly erect, inconspicuously chaffy with narrow black scales; fronds 3-6 inches high; stipes slender, densely tufted, brownish-purple, polished, rachis similar to tip; blades once-pinnate, linear; pinnae 3-7 mm. long, herbaceous, mostly opposite, roundish, crenate margins, obliquely wedge-truncate at base, attached by narrow points; sori medial or nearer the midveins than margins, 3-6 pairs on outer sides of veins, becoming confluent; indusia membranaceous. July to September.

Distribution: Ontario to Alabama, westward to British Columbia and California; widely distributed but local. Sandstone rocks where plenty of water is available.

Specimens examined: *Kellogg, Letterman, Eggert, Engelmann, Palmer, Russell, Pinkerton, Trelease, Morrison, Rickett, Mackenzie, Blankenship.*

ATHYRIUM

1. Fronds simply pinnate.....1. *A. angustifolium*
1. Fronds more than pinnate.....2
2. Fronds deeply bipinnatifid, margins lightly serrate-crenate.....2. *A. acrostichoides*
2. Fronds usually tripinnatifid, margins deeply and irregularly incised.....3
3. Rhizomes creeping, not densely covered with persistent leaf-bases; fronds widest near base; indusia with glandular cilia; spores nigrescent, wrinkled.
.....3. *A. asplenioides*
3. Rhizomes horizontal, completely concealed by thick fleshy bases of old fronds; fronds widest near middle; indusia toothed or short-ciliate, never glandular; spores yellow, slightly papillate.....4. *A. angustum*

1. *Athyrium angustifolium* (Michx.) Milde in Bot. Zeit. 48: 376. 1886. Gray, p. 39; Britton & Brown, ed. 1, 1: 24, ed. 2, 1: 28; Eaton, *pl. 56, fig. 1.* Narrow-leaved spleenwort.

Asplenium pycnocarpon Spreng. Anleit. 3: 112. 1804.

Asplenium angustifolium Michx. Fl. Bor. Am. 2: 265. 1803.

Athyrium pycnocarpon Tidestrom, Elys. Marianum, p. 36. 1906.

Rootstocks stout, creeping, with many long, branched rootlets; stipes green except for brown base; fronds 1-2.5 feet long, membranaceous, herbaceous, pinnate; pinnae 2-5 inches long, 20-30 pairs, short-stalked, linear-oblong, attenuate, margins slightly

wavy; fertile pinnae near top, narrower and shorter; sori 20–30 pairs, linear, slightly curved, lying along outer of bifurcated veins; indusia firm, convex, concealed by strongly confluent sori at maturity. August and September.

Distribution: Quebec to Georgia, westward to Michigan and Missouri; recorded from Kansas and Minnesota. Moist woods and shaded ravines, reported occasionally on sandy soil.

Specimens examined: *Davis, Kellogg, Palmer, Eggert, Trelease, Bush, Pinkerton, Daniels, Emig, Glatfelter.*

2. *Athyrium acrostichoides* (Sw.) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 223. 1899. Gray, p. 39; Britton & Brown, ed. 1, 1: 26, ed. 2, 1: 30; Eaton, *pl.* 50. Silvery spleenwort.

Asplenium acrostichoides Sw. in Schrad. Jour. für die Bot. 2: (1800): 54. 1801.

Asplenium thelypteroides Michx. Fl. Bor. Am. 2: 265. 1803.

Athyrium thelypteroides (Michx.) Desv. in Mem. Soc. Linn. Paris [Prodr. p. 266] 6: 266. 1827.

Rootstocks creeping, horizontal; stipes 8–16 inches long, straw-colored, herbaceous, with a few scales on lower portion; blades lanceolate to ovate-oblong, 1–3 feet long and 6–12 inches broad, narrowed to base, deeply bipinnatifid; ultimate segments distinct, obtuse; margins slightly serrate-crenate; sori 3–6 pairs per segment, arranged more or less evenly along lateral veins, mostly straight, oblong, some double. August to October.

Distribution: New Brunswick to Georgia, westward to Missouri; recorded northward to Minnesota. Rich moist woods, or moist sandy soil.

Specimens examined: *Palmer, Eggert, Davis, Letterman, Broadhead.*

3. *Athyrium asplenioides*³ (Michx.) Desv. in Mem. Soc. Linn. Paris [Prodr. p. 266] 6: 266. 1827. Gray, p. 40; Britton & Brown, ed. 1, 1: 26, ed. 2, 1: 30; Butters in *Rhodora* 19: 169. 1917.

Asplenium Athyrium Spreng. Anleit. 3: 113. 1804.

Athyrium Filix-foemina (L.) Roth in Römer's Arch. f. Bot. 2¹: 106. 1799.

Rhizomes horizontally creeping, partially covered by short persistent leaf bases, the whole structure 1–1.5 cm. in diameter,

³ This species and *A. angustum* are very difficult to distinguish. It is often necessary to have the whole plant, fruiting and not too mature, to be absolutely certain. I have taken the character of the spore as my ultimate criterion.

with conspicuous projections of new growths before fronds of the current season; stipes long, about equal to the deltoid lanceolate fronds; young growths covered with scales soon deciduous, these small and light tan-colored, cell walls thin and inconspicuous; fronds bipinnate to tripinnatifid, second pair of pinnae commonly the longest, the lowest only slightly shorter; pinnae narrower at base; pinnules variously incised but apex more or less obtuse due to the venation, since two veins usually end on the same level; sori longer and narrower than in *A. angustum*, on the anterior side of anterior vein of each lobe of pinnule, and sometimes on the lower veins, of typical athyroid type, rarely double; young indusia ciliate with multicellular glandular-tipped hairs nearly disappearing at maturity, leaving quite even margins; sporangia stalk frequently supplied with a glandular hair; spores furnished with a somewhat nigrescent, wrinkled exospore. July to October.

Distribution: Massachusetts to Florida, westward to Missouri and Texas. Shaded rich woods or cliffs, sandy soil.

Specimens examined: Kellogg, Trelease, Palmer, Bush, Souldard, Blankenship.

4. *Athyrium angustum*⁴ (Willd.) Presl in Rel. Haenk. 1: 39. 1825. Gray, p. 40; Britton & Brown, ed. 1, 1: 26, ed. 2, 1: 30; Butters in Rhodora 19: 169. 1917.

Asplenium Michauxii Spreng. Syst. 4: 88. 1827.

Asplenium Filix-foemina (L.) Roth in Römer's Arch. f. Bot. 2¹: 106. 1799.

Rhizomes horizontal and somewhat oblique, condensed and completely covered by thick fleshy bases, 2-5 cm. in diameter; stipes up to half as long as the frond, a moderate number of scales persistent, 1 × 1.5 mm., dark opaque with thick darker cell walls and narrow cells; fronds bi-tripinnatifid, middle of fronds widest and lower pinnae much shorter and often deflexed, often large forms and polymorphic; pinnae not narrower at base; pinnules and segments with acute apices, due to one vein ending considerably beyond any of its neighbors; fertile fronds consider-

⁴ Butters describes two varieties, namely: var. *elatius* and var. *rubellum*, distinguished chiefly by the dimorphism and thicker texture of the former (a sun form) and the monomorphism and thinner texture of the latter (a shade form). He claims that the latter has a more northerly distribution; but in Missouri the two seem to be purely ecological variations and scarcely worth varietal rank.

ably narrower and more acute than sterile ones; sori short and wide, of typical athyroid type; indusia never glandular but persistently short-ciliate; sporangia stalk rarely bearing glandular hair; spores bright yellow and slightly papillate, no exospore and not wrinkled. June to October.

Distribution: Labrador to Pennsylvania, westward to South Dakota and Missouri. Rich woods.

Specimens examined: *Bush, Davis, Palmer, Engelmann, Kellogg, Eggert, Russell.*

CAMPTOSORUS

1. *Camptosorus rhizophyllus* (L.) Link, Hort. Berol. 2: 69. 1833. Gray, p. 40; Britton & Brown, ed. 1, 1: 21, ed. 2, 1: 26; Eaton, *pl. 8, fig. 1.* Walking fern.

Rootstocks short, creeping; stipes grouped in tufts, spreading, green, fleshy, 1-6 inches long; blades evergreen, subcoriaceous, 4-12 inches long, base auriculate, cordate or hastate, apex attenuate and filiform, rooting at tips (or from auricles); sori numerous, straight or slightly curved, single and on inside of and parallel to veins, near midribs, on both sides of outer veins and becoming confluent at exterior tips; indusia membranaceous. All year.

Distribution: Ontario to Alabama, westward to Minnesota and Oklahoma. Limestone rocks, usually associated with *Entodon* (a moss).

Specimens examined: *Bush, Davis, Engelmann, Trelease, Kellogg, Daniels, Palmer, Pinkerton, Dewart, Russell, Rickett, Weller.*

CHEILANTHES

- | | |
|---|--------------------------|
| 1. Fronds relatively smooth..... | 1. <i>C. alabamensis</i> |
| 1. Fronds hairy or tomentose..... | 2 |
| 2. Plants small, 2-6 inches tall, matted; mature stipes nearly glabrous.. | 2. <i>C. Feei</i> |
| 2. Plants taller, 4-20 inches, not matted; stipes hirsute..... | 3. <i>C. lanosa</i> |

1. *Cheilanthes alabamensis* (Buckl.) Kunze in *Linnaea* 20: 4. 1847. Gray, p. 36; Britton & Brown, ed. 1, 1: 30, ed. 2, 1: 34; Eaton, *pl. 57, fig. 7.*

Rootstocks creeping, short, slender, with dark ferruginous scales; stipes black, wiry, slightly villous at base due to fine rusty scales 3-7 mm. long; blades scabrous to smooth, 2-10 inches long, lanceolate, bipinnate; pinnae acuminate, lower ones shorter than those above; pinnules often auriculate; indusia broad, pale but firm, frequently broken by incision of pinnules. August to October.

Distribution: Florida, westward to Missouri and Arizona. Limestone cliffs.
Specimens examined: *Kellogg, Palmer, Bush.*

2. *Cheilanthes Feei* Moore, Ind. Fil. Gen. 38. 1857. Gray, p. 36; Britton & Brown, ed. 2, 1: 34; Eaton, *pl. 6, fig. 1.*

Cheilanthes lanuginosa Nutt. in Hk. Sp. Fil. 2: 99. 1852.

Rootstocks short, clothed with narrow scales of black centers and thin brown edges; fronds 2-6 inches tall; stipes densely tufted, black or brown, originally woolly, becoming glabrous when mature; blades bi-tripinnate, slightly tomentose above and woolly below; pinnules divided into minute rounded segments, densely crowded; indusia herbaceous, continuous. July to October.

Distribution: Wisconsin to Texas, westward to Nevada and Arizona. Limestone cliffs in dry and exposed localities.

Specimens examined: *Davis, Kellogg, Engelmann, Trelease, Bush, Palmer, Daniels, Pinkerton, Morrison, Uphof.*

3. *Cheilanthes lanosa* (Michx.) Watt in Jour. Bot. 12: 48. 1874. Gray, p. 36; Britton & Brown, ed. 1, 1: 31, ed. 2, 1: 34; Eaton, *pl. 2, fig. 2.*

Cheilanthes vestita Sw. Syn. Fil. 128. 1806.

Rootstocks short, creeping, with pale brown scales; fronds 4-16 inches long; stipes wiry, dark brown, hirsute; blades herbaceous, bipinnate; pinnae hirsute and somewhat glandular; indusia inconspicuous, discontinuous. July to September.

Distribution: New York to Alabama, westward to Oklahoma; recorded from Connecticut and Texas. Sandstone rocks, usually in dry and exposed places.

Specimens examined: *Kellogg, Eggert, Letterman, Palmer, Broadhead, Pinkerton, Muller, Glatfelter, Mackenzie, Swallow, Emig, Blankenship, Link.*

CYSTOPTERIS

1. Pinnae short-stalked on rachises; pinnules at least narrowed at points of attachment; segments ovate, acute, usually variously incised; indusia truncate.....1. *C. fragilis*
1. Pinnae sessile on rachises; pinnules oblong, obtuse, regularly toothed; indusia round or pointed at apex.....2
2. Fronds long-attenuate.....2. *C. bulbifera*
2. Fronds not long-attenuate.....3. *C. bulbifera* var. *horizontalis*

1. *Cystopteris fragilis*⁵ (L.) Bernh. in Schrad. Neues Jour.

⁵ An exceedingly variable species. Hybridization with *C. bulbifera* might account for some of the aberration. Forms bearing bulblets have been included under this group, as that character does not seem to be a constant feature for *C. bulbifera* alone.

Bot. 1²: 27. 1806. Gray, p. 43; Britton & Brown, ed. 1, 1: 13, ed. 2, 1: 15; Eaton, *pl. 53, fig. 1*.

Filix fragilis Underw. Nat. Ferns, ed. 6, 119. 1900.

Rootstocks elongated, often 4–5 inches long, or shorter and condensed, slender, but covered with persistent leaf-bases, chaffy at apex, scales delicate, ovate, acuminate, ferruginous; stipes in a dense cluster, slender, brittle, 4–6 inches long; blades 6–8 inches long and about half as wide, thin and membranaceous, ovate-lanceolate; basal pinnae commonly narrower than the second and third pairs, apparently bipinnate but segments usually connected by narrowly winged midribs, segments roundish-oval to ovate to rhomboid-ovate to ovate-lanceolate, toothed, dentate or irregularly laciniate; veinlets pinnately arranged on midveins, lower ones forked; sori small, roundish, seated on middle of veins nearest midrib; indusia delicate, rounded, ovate, or occasionally with narrow beak-like points, concealed by mature sporangia; lower pinnae often sterile. May to July.

Distribution: Cosmopolitan. Rocky soil, moist woods, preferring alkaline soil.

Specimens examined: *Davis, Engelmann, Trelease, Bush, Palmer, Pinkerton, Eggert, Kellogg, Woodson, Harrison, Mann, Daniels, Blankenship, Duncan, Williams.*

2. *Cystopteris bulbifera* (L.) Bernh. in Schrad. Neues Jour. Bot. 1²: 10. 1806. Gray, p. 43; Britton & Brown, ed. 1, 1: 12, ed. 2, 1: 15; Eaton, *pl. 53, fig. 13*.

Filix bulbifera Underw. Nat. Ferns, ed. 6, 119. 1900.

Rootstocks seldom over one inch long, chaffy at apex and covered with persistent leaf-bases; stipes slender, rather brittle, 6–10 inches long; blades submembranaceous but of a brittle rigidity, triangular-attenuate, 1–4 feet long, 3–5 inches broad at base; pinnae attenuated upward, bipinnate at base, upper pinnules attached by winged rachises; pinnae numerous (up to 40 pairs), oblong; pinnules oblong, obtuse, pinnately lobed; sori numerous, all pinnae fertile, arranged in rows along each side of midveins of pinnules, placed on the lowest superior veinlet of each group near its middle and so near the midvein; indusia truncate and fragile, covered by mature sporangia; bulblets sometimes present on the under side of the frond attached near the base of or on the pinnae. July to August.

Distribution: Newfoundland to Georgia, westward to Michigan and Arkansas;

recorded from Utah and Arizona. Rocky soil, preferring limestone, in moist shady situations.

Specimens examined: *Bush, Davis, Kellogg, Trelease, Palmer, Pinkerton, Daniels, Letterman.*

3. *Cystopteris bulbifera* var. *horizontalis* Lawson in Bot. Soc. Edinb. Trans. 8: 40. 1866. Pl. 5, fig. 1.

Fronds triangular-lanceolate, broad at base, not more than three or four times longer than broad; pinnae horizontal; lowest pinnules often quite broad with irregularly cut lobes and bearing numerous medium-sized sori along the lateral veins, sometimes almost tripinnate, or pinnules irregularly lobed, merely ovate-lanceolate. May to October.

Distribution: southern Missouri and northern Arkansas. Damp limestone bluffs.

Specimens examined: Ilasco, Ralls Co., *Davis 2663*; Sulphur Springs, Jefferson Co., coll. of Oct. 23, 1898, *Trelease*; Terre Bleue Cr., Ste. Genevieve Co., coll. of Aug. 29, 30, 1898, *Trelease*; Lesterville, Reynolds Co., coll. of June 5, 1929, *Kellogg*; Tecumseh, Ozark Co., *Palmer 32896*.

DENNSTAEDTIA

1. *Dennstaedtia punctilobula* (Michx.) Moore, Ind. Fil. Gen. 97. 1857. Gray, p. 45; Britton & Brown, ed. 1, 1: 12, ed. 2, 1: 14; Eaton, *pl. 44*.

Dicksonia pilosiuscula Willd. Enum. 1076. 1809.

Dicksonia punctilobula Hk. Sp. Fil. 1: 79. 1846.

Rootstocks extensively creeping, slender, scaleless but finely hairy at tips, irregularly branching with many long slender rootlets; stipes rather stout, light brown, chaffless, slightly puberulent; blades 1-3 feet long, ovate-lanceolate, acuminate, delicately herbaceous, hairy and minutely glandular, tripinnatifid; pinnae numerous, lanceolate, pointed, second pair a little longer than first; pinnules adnate to rachis and usually decurrent on it, rhomboid-ovate, pinnatifid into oblong and obtuse cut-toothed lobes; sori minute, on upper margins of the lobes of the pinnules; indusia cup-like, delicate. August.

Distribution: New Brunswick to Georgia, westward to Illinois and Missouri. Crevices of La Motte sandstone, rare.

Specimens examined: *Trelease, Russell, Eggert, Pinkerton.*

NOTHOLAENA

1. *Notholaena dealbata* (Pursh) Kunze in Amer. Jour. Sci. II. 6: 82. 1848, as *Nothochlaena*. Gray, p. 35; Britton & Brown, ed. 1, 1: 32, ed. 2, 1: 35; Eaton, *pl. 9, fig. 2*.

Cheilanthes dealbata Pursh, Fl. Am. Sept. 2: 671. 1814.

Nothochlaena pulchella Kunze in Bot. Zeit. 1: 633. 1843.

Pellaea dealbata (Pursh) Prantl in Engler's Bot. Jahrb. 3: 417. 1882.

Notholaena nivea var. *dealbata* Davenp. in Cat. Davenp. Herb. Suppl. 44. 1883.

Rootstocks short, creeping, with narrow brown chaffy scales; stipes 1–4 inches long, tufted, wiry, slender, copper-brown, as are the rachises; blades 2–4 inches long, broadly deltoid-ovate, 4–5-pinnate, all but ultimate segments alternate, those sometimes opposite; segments obovate-oval and entire or several-lobed, 1–2 mm. broad, upper surfaces pale green, coriaceous, lower white and powdery, giving a silvery appearance; sporangia seated on upper portions of the veins; no indusia, but a protection afforded by the slightly turned-back margins. June to September.

Distribution: Missouri and Kansas to central Texas; recorded from Nebraska. Dry calcareous rocks.

Specimens examined: *Daniels, Bush, Palmer, Blankenship.*

ONOCLEA

1. *Onoclea sensibilis* L. Sp. Pl. 2: 1062. 1753. Gray, p. 45; Britton & Brown, ed. 1, 1: 9, ed. 2, 1: 11; Eaton, *pl. 72, fig. 1.* Sensitive fern.

Rootstocks slender, creeping, rooting freely and often forking; stipes coarse, straw-like, hollow, flattened, light brown when dry; sterile blades triangular or triovate, midribs winged, widening toward the apex, sinuses rounded; lowest segments broadly lanceolate, herbaceous, sensitive to frost; veins conspicuous, reticulate; margins variously rounded, lobed, toothed, serrate or acute; fertile fronds 12–18 inches long, pinnate, contracted; each segment a pouch filled with several sporangia; delicate hood-like indusia. August to November.

Distribution: Newfoundland to Florida, westward to Kansas. Swamps or damp rich soil.

Specimens examined: *Bush, Davis, Eggert, Palmer, Morrison, Muller, Daniels, Blankenship, Mackenzie, Williams.*

PELLAEA

1. Pinnae dichotomously branched at apex.....3. *P. atropurpurea* var. *cristata*
1. Pinnae not branched at apex.....2

2. Stipes smooth, reddish-brown; pinnae usually membranaceous, pale green, short, more or less rounded at both corners and tending to divide at bases into two or more parts.....1. *P. glabella*
 2. Stipes scabrous, dark purplish-black; pinnae coriaceous, blue-green, elongate and seldom redivided.....2. *P. atropurpurea*

1. ***Pellaea glabella*** Mett., Kuhn in *Linnaea* 36: 87. 1869. Gray, p. 37; Britton & Brown, ed. 2, 1: 33.

Pellaea atropurpurea var. *Bushii* Mackenzie, *Flora Jackson County, Mo.*, p. 5. 1902.

Stipes and rachises brownish-red, smooth or but slightly hairy; fronds simply pinnate above, the lower ternate or rarely quinate (the entire pinnule seems to be breaking at the base—a possible tendency toward compound pinnules); pinnae membranaceous to coriaceous but always pale green. April to October.

Distribution: Ontario and Vermont to Pennsylvania, westward to South Dakota and northern Arkansas. Exposed high places on limestone cliffs.

Specimens examined: *Davis, Eggert, Kellogg, Bush, Palmer, Pinkerton, Trelease.*

2. ***Pellaea atropurpurea*** (L.) Link, *Fil. Sp. in Hort. Berol.* 59. 1841. Gray, p. 37; Britton & Brown, ed. 1, 1: 29, ed. 2, 1: 33; Eaton, *pl. 54, fig. 4.*

Rootstock short, densely covered with rusty scales about 2 mm. in length; fronds 4–12 inches long, pinnate or below bipinnate, coriaceous; fertile segments linear, more or less pointed at apex; sterile segments approaching oval, shortly stalked; veins obscure; continuous indusia of reflexed margins. June to September.

Distribution: Connecticut to Florida, westward to South Dakota and Texas. Near small limestone rocks or on top of cliffs where there is loose soil.

Specimens examined: *Davis, Engelmann, Trelease, Broadhead, Bush, Palmer, Pinkerton, Kellogg, Daniels.*

3. ***Pellaea atropurpurea*** var. ***cristata*** Trel. in *Rept. Mo. Bot. Gard.* 12: 77. 1901. Gray, p. 37.

Pinnae dichotomously forked.

Distribution: known only from Eureka, Missouri. Limestone.

Specimens examined: Eureka, 1899, *Pauls.*

POLYPODIUM

1. Blades smooth, green.....1. *P. virginianum*
 1. Blades densely scaly, grayish.....2. *P. polypodioides*

1. **Polypodium virginianum** L. Sp. Pl. 2: 1085. 1753. Gray, p. 34; Britton & Brown, ed. 1, 1: 32, ed. 2, 1: 36; Eaton, *pl. 31, fig. 1*. Common polypody.

Polypodium vulgare L. Sp. Pl. 2: 1085. 1753.

Rootstocks close to surface of soil, covered with chaffy, red-brown scales; stipes smooth, herbaceous, light green; blades ovate-oblong or narrowly oblong, subcoriaceous or chartaceous, evergreen, simple, deeply pinnatifid, smooth; segments linear-oblong, obtuse or slightly acute, crenulate and serrate, sinuses rounded, alternate, margins obscurely dentate; sori large, naked. July.

Distribution: Newfoundland to Florida, westward to Minnesota and Arkansas. On sandstone or sandy soil.

Specimens examined: *Eggert, Russell, Engelmann, Trelease, Pinkerton, Letterman, Greene.*

2. **Polypodium polypodioides** (L.) Hitchc. in Rept. Mo. Bot. Gard. 4: 156. 1893. Gray, p. 34; Britton & Brown, ed. 1, 1: 33, ed. 2, 1: 36; Eaton, *pl. 26, fig. 2*. Gray polypody.

Polypodium incanum Sw. Fl. Ind. Occ. 3: 1645. 1806.

Rootstocks woody, covered with small dark brown scales; stipes 1-4 inches long, slender, bearing peltate ovate scales with dark brown centers; blades oblong-lanceolate, pinnate; segments oblong, obtuse, entire, sessile, separated by rounded sinuses, alternate, upper surfaces smooth or with few scales, lower densely scaly; fruit dots small and naked. July to September.

Distribution: Massachusetts to Florida, westward to Missouri and Texas. Usually an epiphyte on swamp trees, particularly *Taxodium distichum*; also on sandstone rocks.

Specimens examined: *Eggert, Trelease, Bush, Pinkerton, Rickett, Kellogg, Mackenzie, Meek.*

POLYSTICHUM

1. Margins serrulate; fertile pinnae contracted; sori confluent. . . . 1. *P. acrostichoides*

1. Margins deeply toothed or pinnatifid; fertile pinnae scarcely contracted; sori not confluent and appearing only on tips of lower pinnae.

..... 2. *P. acrostichoides* var. *incisum*

1. **Polystichum acrostichoides** (Michx.) Schott, Gen. Fil. 17. 1834. Gray, p. 40; Britton & Brown, ed. 1, 1: 14, ed. 2, 1: 16; Eaton, *pl. 34*. Christmas fern.

Aspidium acrostichoides Sw. Syn. Fil. 44. 1806.

Dryopteris acrostichoides Kuntze, Rev. Gen. Pl. 2: 812. 1891.

Rootstocks stout, creeping, with persistent leaf-bases; stipes densely tufted, with chaff of large golden-brown scales, 5–7 mm. wide; blades lanceolate, pinnate, 1–2 feet long, 3–5 inches wide, rigid, evergreen, subcoriaceous; pinnae numerous, 1–3 inches long, oblong-lanceolate, short-stalked, upwardly falcate or lowest slightly deflexed, apex acutish, upper sides auriculate; margins serrulate to incised with incurved bristle-pointed teeth; veins free, branching three to four times; upper pinnae of fertile fronds more or less contracted and heavily soriferous; sori terminal on lower veinlets in 2–4 rows, becoming confluent with age; indusia round, indurated, not glandular, persistent. July to August.

Distribution: Maine to Florida, westward to Michigan and Texas; recorded from Nova Scotia. Shady hillsides of ravines, in rich soil which is interspersed with rocks; common.

Specimens examined: *Bush, Davis, Eggert, Trelease, Palmer, Pinkerton, Emig, Kellogg, Daniels, Thomas, Mackenzie.*

2. *Polystichum acrostichoides* var. *incisum* Gray, Man. Bot. ed. 1, 632. 1848. Gray, p. 40; Britton & Brown, ed. 1, 1: 14, ed. 2, 1: 16.

Polystichum acrostichoides var. *Schweinitzii* (Beck) Small in Bull. Torr. Bot. Club 20: 464. 1893.

Aspidium schweinitzii Beck, Bot. North. & Mid. States, ed. 1, 449. 1833.

Aspidium acrostichoides var. *incisum* D. C. Eaton, Ferns N. Am. 1: 258. 1879.

Segments few and distant, large, irregularly incised; upper pinnae covered by confluent sori, lower ones fertile at tips only, sori large; veins numerous, frequently overlapping to form irregular areoles.

Distribution: This seems to be nearly as common as the type in southern Missouri and northern Arkansas; but since there appears to be a series of intermediate forms between the two I have not attempted to separate the individual ranges.

PTERETIS

1. *Pteretis nodulosa* (Michx.) Nieuwl. in Am. Midl. Nat. 4: 334. 1916. Gray, p. 45; Britton & Brown, ed. 1, 1: 9, ed. 2, 1: 11; Eaton, *pl.* 73. Ostrich fern.

Osmunda Struthiopteris L. Sp. Pl. 2: 1066. 1753.

Onoclea Struthiopteris Hoffm. Deutsch. Fl. 2: 11. 1795.

Struthiopteris germanica Willd. Enum. 1071. 1809.

Matteuccia Struthiopteris (L.) Todaro in Syn. Pl. Acot. Vasc. Sicilia, p. 30. 1866.

Matteuccia nodulosa (Michx.) Fernald in Rhodora 17: 164. 1915.

Rootstocks stout and ascending, with slender underground stolons; sterile blades 2–7 feet high, 6–15 inches broad, short-stalked, broadly oblanceolate, abruptly short-acuminate, gradually narrowed below middle, lower pinnae reduced; pinnae narrow, deeply pinnatifid; segments oblong, obtuse, entire; veins simple, fertile blades 1–7.5 feet high, with pod-like brown pinnae, included sori confluent. July.

Distribution: Newfoundland to New York, westward to Michigan and Missouri; recorded from Virginia. Alluvial soil.

Specimens examined: Livonia, Putnam Co., Bush 7780, 7780A, 7780B.

PTERIDIUM

1. Pinnules much elongated, seldom redivided. 2. *P. latiusculum* var. *pseudocaudatum*
1. Pinnules oblong-lanceolate, at least a few pinnatifid. 1. *P. latiusculum*

1. *Pteridium latiusculum* (Desv.) Hieron. Wissenschaftl. Ergeb. d. Schwed. Rhodesia-Kongo-Exp. 1911–12, Heft 1, p. 7. 1914; Maxon in Am. Fern Jour. 9: 43. 1919. Gray, p. 36; Britton & Brown, ed. 1, 1: 28, ed. 2, 1: 32; Eaton, pl. 35.

Pteris aquilina L. Sp. Pl. 2: 1075. 1753.

Pteridium aquilinum Kuhn in Decken, Reisen in Ost-Afrika 3³: 11. 1879.

Rootstocks cord-like, creeping, blackish, deeply buried; stipes solitary, erect, naked, 1–3 feet high, swollen at base, brownish; blades 2–4 feet long, 1–3 feet broad, triangular-ovate, rigidly subcoriaceous, subternate; the long-stalked basal pinnae and middle ones bipinnate, those above lobed or simple; segments oblong-lanceolate, under surfaces glabrous or pubescent; veins close-packed, free; indusia continuous around the edge of the pinnules, double. July to September.

Distribution: Cosmopolitan, open woods, preferring sandy soil.

Specimens examined: Kellogg, Eggert, Palmer, Bush.

2. *Pteridium latiusculum* var. *pseudocaudatum* Maxon in Am. Fern Jour. 9: 44. 1919. Gray, p. 36; Britton & Brown, ed. 2, 1: 32.

The variety occurs in this region but does not seem to have a distribution different from that of the species. It is distinguished by its very narrow elongated pinnules.

THELYPTERIS

Dryopteris Adans.

Polystichum Roth

Aspidium Swartz

Nephrodium Richard

Lastrea Bory

Phegopteris (Presl) Fée

- | | |
|--|---|
| 1. Indusia absent..... | 5. <i>T. hexagonoptera</i> |
| 1. Indusia present..... | 2 |
| 2. Blades bipinnatifid or bipinnate; segments not spinulose..... | 3 |
| 2. Blades tripinnatifid or tripinnate; segments spinulose..... | 4 |
| 3. Sori medial, small; blades membranaceous, not evergreen..... | |
| | 1. <i>T. palustris</i> var. <i>pubescens</i> |
| 3. Sori near margins, large; blades subcoriaceous, evergreen..... | 2. <i>T. marginalis</i> |
| 4. Indusia glandless; pinnae decidedly oblique to rachises, scales of stipe pale brown..... | 3. <i>T. spinulosa</i> |
| 4. Indusia glandular; pinnae more or less at right angles to rachises; scales of stipe brown with a dark center..... | 4. <i>T. spinulosa</i> var. <i>intermedia</i> |

1. *Thelypteris palustris* var. *pubescens*⁶ (Lawson) Fernald in *Rhodora* 31: 34. 1929. Gray, p. 41; Britton & Brown, ed. 1, 1: 15, ed. 2, 1: 18; Eaton, *pl.* 30. Marsh shield-fern.

Thelypteris Thelypteris Nieuwl. in *Am. Midl. Nat.* 1: 226. 1910.

Rootstocks slender, creeping, blackish, nearly naked; stipes as long or longer than the blades, blackish at base, sparingly chaffy; blades oblong-lanceolate, pinnate, 1-3 feet long, 4-6 inches wide, membranaceous, scarcely narrowed at base, short-acuminate; pinnae 20-30 pairs, alternate, short-stalked, approximately at right angles to stalks, linear-lanceolate, broadest at base, deeply pinnatifid; segments oblong-obtuse, mostly entire; veins pinnate, usually once-forked; fertile fronds usually on longer stalks and of narrower segments than the former; sori nearly medial, crowded; indusia glabrous. August.

⁶ Eaton mentions an unusual form—"the lower two or three pairs are usually but little shorter than those above them; but fronds are occasionally found in which they are conspicuously reduced." Such a form is one from Iron Lake, Iron Co., Kellogg 1634.

Distribution: New Brunswick to Florida, westward to Texas. Wet woods.
Specimens examined: *Eggert, Kellogg, Bush, Pinkerton.*

2. *Thelypteris marginalis* (L.) Nieuwl. in Am. Midl. Nat. **1:** 226. 1910. Gray, p. 42; Britton & Brown, ed. 1, **1:** 17, ed. 2, **1:** 20; Eaton, *pl.* 55. Evergreen wood fern.

Rootstocks stout, ascending, covered with long chaffy brown scales; stipes several inches to a foot long, light tan, somewhat chaffy; blades 6–30 inches long, evergreen, subcoriaceous, ovate-lanceolate, scarcely narrowed at base, deeply bipinnatifid; pinnae numerous, practically sessile, lanceolate, acuminate, slightly broader above the base; pinnules adnate to narrowly winged secondary rachis, oblong to oblong-lanceolate, faintly crenately-toothed; veins free, forked or pinnately branched; sori large, near margins of segments; indusia hard, orbicular-reniform, glabrous, dark brown. July to August.

Distribution: Nova Scotia to Georgia, westward to Kansas and Oklahoma. Sandstone ledges where it is moderately moist.

Specimens examined: *Letterman, Engelmann, Eggert, Kellogg, Palmer, Pinkerton, Muller, Rickett, Mackenzie, Broadhead, Link, Blankenship, Trelease.*

3. *Thelypteris spinulosa* (Retz.) Nieuwl. in Am. Midl. Nat. **1:** 226. 1910. Gray, p. 43; Britton & Brown, ed. 1, **1:** 18, ed. 2, **1:** 21; Eaton, *pl.* 68. Spinulose shield-fern.

Rootstocks stout, creeping, chaffy; stipes 4–14 inches long, chaffy; blades 0.5–3 feet long, ovate-lanceolate to oblong, acuminate, bi-tripinnate, firmly membranaceous; primary pinnae short-stalked, lower pairs triangular-ovate to triangular-lanceolate, remaining pinnae gradually narrower in outline; secondary rachises narrowly wing-margined; pinnules oblong, subacute, incised with spinulose-serrate lobes; sori small, sub-marginal, terminal on veinlets; indusia flat, round-reniform, glandless.

Distribution: Labrador to Virginia, westward to Idaho. Moist woods, alluvial soil.

Specimens examined: Neeleyville, Butler Co., coll. of Oct. 30, 1899, *Russell.*

4. *Thelypteris spinulosa* var. *intermedia* (Retz.) Nieuwl. in Am. Midl. Nat. **2:** 278. 1912. Gray, p. 43; Britton & Brown, ed. 2, **1:** 22.

Similar to the species except for the glandular indusia and right-angled relation of pinnae to rachis.

Distribution: In Missouri—more northern, sandy soil.

Specimens examined: Pickle Springs, Ste. Genevieve Co., *Pinkerton 1*; and coll. of May 21, 1930, *Kellogg*.

5. *Thelypteris hexagonoptera* (Michx.) Weatherby in *Rhodora* 21: 179. 1919. Gray, p. 35; Britton & Brown, ed. 1, 1: 19, ed. 2, 1: 23; Eaton, *pl. 65*. Broad beech-fern.

Phegopteris hexagonoptera (Michx.) Fée, Gen. Fil. 243. 1850-2.

Rootstocks elongated, slender, creeping, chaffy with gold scales; stipes 8-20 inches long, slender, greenish, or straw-colored; blades triangular, 7-12 inches long, 7-15 inches wide, thinly herbaceous, deep green, slightly hairy or granular, bipinnatifid; pinnae adnate to winged rachis, the lowermost ones broadest and largely ovate to ovate-lanceolate, and others lanceolate; segments usually bluntly acuminate and crenate; veins pinnate and free, branched or not; sori borne over whole frond, small, near end of veins and so near margins; no indusia. August.

Distribution: New Brunswick to Delaware, westward to Oklahoma. Moist woods and ravines.

Specimens examined: *Davis, Eggert, Palmer, Kellogg, Bush, Pinkerton, Rickett, Link*.

WOODSIA

1. *Woodsia obtusa* (Spreng.) Torr. Cat. Pl. in Geol. Rept. N. Y. 195. 1840. Gray, p. 44; Britton & Brown, ed. 1, 1: 11, ed. 2, 1: 14; Eaton, *pl. 71*.

Rootstocks short, creeping, chaffy with narrow light brown scales; stipes 2-6 inches long, green with darkish base in living plants and drying to a bright brownish straw color; fronds 8-15 inches long, broadly lanceolate, narrower at base than in middle, abruptly terminating at tip, membranaceo-herbaceous, minutely glandular, deep blue-green in color, nearly bipinnate; pinnae remote, short-stalked, obtuse, triangular, ovate to oblong, mostly opposite; segments oblong, obtuse, crenately toothed; sori subterminal on veins, nearer margin than midveins; young indusia subglobose, splitting into several irregular lobes which extend out beyond the sporangia, difficult to detect. September.

Distribution: Vermont to Alabama, westward to Wisconsin and Texas; recorded from Nova Scotia. Moist calcareous or acid soil.

Specimens examined: *Davis, Kellogg, Palmer, Pinkerton*.

WOODWARDIA

1. *Woodwardia areolata* (L.) Moore, Ind. Fil. Gen. 45. 1857. Gray, p. 38; Britton & Brown, ed. 1, 1: 20, ed. 2, 1: 25; Eaton, pl. 22, fig. 2.

Lorinseria areolata (L.) Presl in Epim. Bot. 72. 1849.

Acrostichum areolatum L. Sp. Pl. 2: 1069. 1753.

Woodwardia angustifolia J. E. Smith in Mem. Acad. Turin 5: 411. 1793.

Rootstocks creeping, several to 12 inches long, often branched, less than 1/4 inch thick, with some scales near apex; stipes dark at base, paler above, bearing a few scales, dimorphic; sterile fronds 9–10 inches long, oblong-ovate, pinnate, bright green above, paler below; rachis winged from tip to just below base of blades; sinuses rounded, segments acute, 1–4 inches long, 0.5–1 inch wide, finely serrate, membranaceous; veins finely reticulated, with a longitudinal row of narrow areoles along each side of midribs and midveins, and several rows of hexagonal areoles and free veins running outwards to serrated edges; fertile fronds taller, with a darker stalk; segments and wing of rachis much narrowed; one row of areoles on each side of midribs, each covered by a brown involucre attached to the outer enclosing veins and open along midrib; sporangia also from enclosing veinlets; sterile fronds appearing in May and fertile ones later. August to October.

Distribution: Massachusetts to Florida, westward to Missouri and Texas; recorded from Maine. Swamps and moist soil.

Specimens examined: Poplar Bluff, Butler Co., July, 1898, *Eby*.

EQUISETACEAE

EQUISETUM

1. Stems annual; dimorphic 1. *E. arvense*
1. Stems perennial; monomorphic 2
2. Sheaths cylindrical, green, turning gray, with black lines at bases and tops, short and undilated, splitting with age; ridges almost smooth; often very large plants 2. *E. praealtum*
2. Sheaths funnel-shaped, green with narrow black limbs, elongate, not splitting; ridges with one row of tubercles; medium-sized plants 3. *E. laevigatum*

1. *Equisetum arvense* L. Sp. Pl. 2: 1061. 1753. Gray, p. 52; Britton & Brown, ed. 1, 1: 36, ed. 2, 1: 39.

Rootstock tuberiferous, felted with brown wool, extensively creeping; fronds dimorphic; sterile ones annual, prostrate or erect, green, rather slender, 12–24 inches high, 6–19 furrowed, with scattered stomata; sheaths whitish, tipped with about 12 acuminate, brown, separate teeth; branches whorled, simple or compound, not drooping, the 3–4 angled sheaths of branches consisting usually of 4 teeth, or often 3, rarely 5, long and acuminate; fertile fronds annual, appearing in early spring before sterile ones, usually unbranched, succulent, and withering after spores are ripe, 4–10 inches high, light brown, sheaths conspicuous, long, flaring and pointed, of 8–12 teeth; spikes not apiculate; variable. May.

Distribution: Greenland to Alabama, westward to Alaska and California. Sandy soil, in waste places, along streams, etc.

Specimens examined: *Davis, Kellogg, Bush, Daniels, Palmer, Letterman, Eggert, Trelease, Daniels, Mackenzie.*

2. *Equisetum praealtum*⁷ Raf. Fl. Ludovic. 13. 1817. Gray, p. 53; Britton & Brown, ed. 1, 1: 38, ed. 2, 1: 41.

Equisetum hyemale var. *robustum* A. A. Eaton in Fern Bull. 11: 74. 1903.

Hippochaete prealta (Raf.) Farwell in Mem. N. Y. Bot. Gard. 6: 467. 1916.

Equisetum robustum A. Br., Engelm. in Amer. Jour. Sci. 46: 88. 1844.

Fronds perennial, evergreen, 3–11 feet high, erect; stems rough, 20–48 ridges bearing silica in single rows; sheaths cylindrical, short-appressed, not dilated or only slightly when young,⁸ at first green but soon turning black or gray with black bands above and below, splitting with age; sheath segments normally tricarinate; teeth dark and caducous; cones pointed. May.

⁷ Schaffner (Am. Fern Jour. 13: 33–41. 1923), says: "Although perennial, *E. praealtum* usually bears cones on shoots of the season. Shoots sterile the first year may bear cones the second, both terminal and on lateral branches. Branching is rare the first season unless the shoot is injured, but the second year branching is common even on uninjured shoots. *E. praealtum* is an exceedingly variable species, some forms recognized probably being genetic and some ecological, but none of these forms passes out of the specific limits as usually drawn. Some are short and robust; some tall and massive; some very slender."

⁸ Young shoots are often very difficult to distinguish from *E. laevigatum*.

Distribution: Quebec to Georgia, westward to British Columbia and New Mexico. Wet sandy places.

Specimens examined: *Davis, Engelmann, Bush, Palmer, Pinkerton, Eggert, Trelease, Daniels, Throuse, Demetrio.*

3. *Equisetum laevigatum* A. Br., Engelm. in Amer. Jour. Sci. 46: 87. 1844. Gray, p. 53; Britton & Brown, ed. 1, 1: 38, ed. 2, 1: 42.

Fronde perennial, erect, mostly simple, pale green, 1–5 feet high, 14–30 ridged, almost smooth, with stomata in two rows on each side of depressions; sheaths funnel-shaped, elongated, and green with usually a narrow black band at the top; white-margined teeth soon deciduous; cones pointed. May to June.

Distribution: New York to North Carolina, westward to Washington and California. Along streams, especially in sandy soil.

Specimens examined: *Engelmann, Bush, Daniels, Eggert, Palmer.*

OSMUNDACEAE

OSMUNDA

1. Sterile fronds truly bipinnate; pinnules stalked and widely separated.
 1. *O. regalis* var. *spectabilis*
1. Sterile fronds bipinnatifid. 2
2. Fronds dimorphic; sterile pinnae with tufts of brown hairs at base; apices of
 fronds and pinnae tapering; veins inconspicuous. 2. *O. cinnamomea*
2. Fronds monomorphic but fertile part of frond is the middle several pairs of
 pinnae; no tufts of hair at base of pinnae; apices of fronds and pinnae
 abruptly narrowed and scarcely acute; veins dark-colored, conspicuous.
 3. *O. Claytoniana*

1. *Osmunda regalis* var. *spectabilis* Fernald in Rhodora 32: 72. 1930. Gray, p. 46; Britton & Brown, ed. 1, 1: 5, ed. 2, 1: 7.

Rootstocks stout, creeping, covered with persistent leaf-bases; fronds 2–6 feet high, stipes never chaffy, green or yellow, rounded on back, flattened on front; blades ovate-oblong, bipinnate; pinnae mostly opposite, ovate; pinnules unequal, 6–12 pairs plus the terminal one, subcoriaceous, short-petioled, distant, oval-oblong or oblong-lanceolate, ultimate ones often auriculate on lower side, margins crenulate-serrate, apex obtuse or subacute; apical pinnae fertile, bipinnate, ultimate divisions thread-like, containing no chlorophyll, entirely covered with sporangia. May to July.

Distribution: Newfoundland to Florida, westward to Saskatchewan and Mississippi. Lowlands, swamps, marshes, and wet woods.

Specimens examined: *Eggert, Palmer, Kellogg, Bush, Pinkerton, Engelmann, Trelease, Mackenzie.*

2. *Osmunda cinnamomea* L. Sp. Pl. 2: 1066. 1753. Gray, p. 47; Britton & Brown, ed. 1, 1: 5, ed. 2, 1: 7.

Rootstocks creeping, massive, bearing circular clusters of sterile leaves with one or more fertile ones within; fronds dimorphic, sterile ones 1 foot or more high, oblong-lanceolate, acuminate, tapering, deeply pinnatifid; pinnae oblong-lanceolate, acute, tapering, tomentose tuft at base of each pinna; pinnules obtuse, subcoriaceous, green; veins inconspicuous, veinlets once-forked near midvein; margins entire or obscurely crenulate; fertile fronds about as tall as the sterile, bipinnate, and covered with cinnamon-colored sporangia, arising early in the spring preceding the sterile ones. May and June.

Distribution: Newfoundland, westward to Minnesota and New Mexico. Sandstone.

Specimens examined: *Eggert, Trelease, Kellogg, Pinkerton, Russell.*

3. *Osmunda Claytoniana* L. Sp. Pl. 2: 1066. 1753. Gray, p. 46; Britton & Brown, ed. 1, 1: 6, ed. 2, 1: 8.

Rootstocks creeping, stout, with imbricated leaf-bases; stipes several inches to 2 feet long, woolly when young but never chaffy; fertile fronds taller than the sterile and in the midst of the crown formation, oblong-lanceolate, 1-4 feet long; lowest pinnae about half as long as middle ones, acute and often rounded; pinnae barely acute, never acuminate, short-stalked, lanceolate from a broad base; pinnules close; 2-6 pairs of fertile pinnae near middle of frond, shorter than sterile pinnae and deflexed in a mature specimen, closely bipinnate, woolly, covered with bivalvular reticulated sporangia. May to July.

Distribution: Newfoundland to North Carolina, westward to Minnesota and Missouri. Swamps and moist woods, moist sandstone ledges.

Specimens examined: *Bush, Eggert, Davis, Palmer.*

LYCOPODIACEAE

LYCOPIDIUM

1. Sporophylls segregated into slender cones; habit of plants fan-like.
 3. *L. complanatum* var. *flabelliforme*

1. Sporophylls not differing from vegetative leaves; habit of plants rope-like.....2
 2. All the leaves broadest above the middle; margins jagged.....1. *L. lucidulum*
 2. Shorter leaves broadest at base; margins entire or slightly denticulate.....
2. *L. lucidulum* var. *porophilum*

1. *Lycopodium lucidulum* Michx. Fl. Bor. Am. 2: 284. 1803. Gray, p. 55; Britton & Brown, ed. 1, 1: 40, ed. 2, 1: 44.

Stems assurgent from decumbent persistent bases giving rise to a few vertical stems; leaves dark green and shining, widespread or becoming deflexed, acute, broadest above middle, erose-denticulate, arranged in alternating series of long and short members, the latter often entire and usually bearing the sporangia; gemmiferous. August to October.

Distribution: Newfoundland to Delaware, westward to Alaska and Washington. On sandstone only, usually associated with *Sphagnum*.

Specimens examined: Kellogg, Eggert, Pinkerton.

2. *Lycopodium lucidulum* var. *porophilum* (Lloyd & Underw.) Clute, Fern Allies, p. 3. 1905. Gray, p. 55; Britton & Brown, ed. 2, 1: 44.

Lycopodium porophilum Lloyd & Underw. in Bull. Torr. Bot. Club 27: 150. 1900.

Essentially like *L. lucidulum* except that the shorter leaves are broadest at the base and the margins are nearly smooth, and are not deflexed.

Distribution: in the same places as the species. Sandstone.

Specimens examined: Terre Bleue Cr., Ste. Genevieve Co., coll. of Aug. 29, 1898, Trelease, and Pinkerton 31.

3. *Lycopodium complanatum* var. *flabelliforme* Fernald in Rhodora 3: 280. 1901. Gray, p. 57; Britton & Brown, ed. 1, 1: 43, ed. 2, 1: 48.

Rhizomes slender, creeping, with numerous erect stems which branch irregularly, giving rise to a flattened fan-shaped vegetative structure, about a foot high with 4-ranked imbricated scale-leaves, those of the two lateral rows broad, with spreading tips, of the upper row narrow and incurved, and of the lower row minute deltoid-cuspidate; peduncles long, dichotomously branched at tips and bearing a number of slender cones about an inch long. August and September.

Distribution: Greenland to West Virginia, westward to Alaska and Idaho. Open pine woods on sandy soil.

Specimens examined: Pickle Springs, Ste. Genevieve Co., Kellogg 8718.

SELAGINELLACEAE

SELAGINELLA

1. Plants bearing ill-defined strobili; leaves dimorphic, 4-ranked. 1. *S. apoda*
 1. Plants bearing distinct strobili; leaves of one kind, spirally arranged. 2. *S. rupestris*

1. ***Selaginella apoda*** (L.) Fernald in *Rhodora* 17: 68. 1915. Gray, p. 58; Britton & Brown, ed. 1, 1: 45, ed. 2, 1: 49.

Selaginella apus (L.) Spring in Mart. Fl. Bras. 1²: 119. 1840.

Stems prostrate and creeping, 1-4 inches long, pale green, delicate; leaves of two kinds, four-ranked and spreading, the smaller pointed and appressed to the stem; no distinct cones; fertile leaves near tip of branches, those containing macrospores conspicuously bulged. July to September.

Distribution: Massachusetts to Florida, westward to Michigan and Louisiana. Moist shaded places, among grasses.

Specimens examined: Eggert, Bush, Palmer, Mackenzie.

2. ***Selaginella rupestris*** (L.) Spring in Mart. Fl. Bras. 1²: 118. 1840. Gray, p. 57; Britton & Brown, ed. 1, 1: 44, ed. 2, 1: 49.

Stems densely tufted, bearing occasional sterile runners; all leaves alike, narrow, appressed, and imbricated, bristle-tipped, gray-green; strobili four-sided. August to October.

Distribution: Quebec to Alabama, westward to Minnesota and Oklahoma. In dry exposed places where there is a little soil, sandstone, or chert.

Specimens examined: Eggert, Russell, Bush, Palmer, Pinkerton, Greene, Broadhead, VanIngen, Shepard.

ISOETACEAE

ISOETES

1. Megaspores reticulate; sporangia unmarked. 1. *I. Engelmanni*
 1. Megaspores tuberculate; sporangia marked in some way. 2
 2. Megaspores less than 480 μ in diameter; sporangia marked with brown spots.
 2. *I. melanopoda*
 2. Megaspores more than 480 μ in diameter; sporangia marked with brown lines.
 3. *I. Butleri*

1. ***Isoetes Engelmanni*** A. Br. in *Flora* 29: 178. 1846. Gray, p. 61; Britton & Brown, ed. 1, 1: 48, ed. 2, 1: 53.

Corms 2-lobed; leaves 15-60, 13-50 cm. long, light green; sto-

mata numerous; peripheral strands variable in number or none; sporangia oblong, unspotted, with narrow velum; megaspores white, 400–570 μ in diameter, distinctly marked with honeycomb network of narrow ridges; microspores 21–30 μ , seldom 33 μ , in length, smooth to minutely roughened.

Distribution: eastern border to Mississippi valley. Near ponds.

Specimens examined: *Engelmann*.

2. *Isoetes melanopoda* Gay and Dur. in Bull. Soc. Bot. Fr. 11: 102. 1864. Gray, p. 61; Britton & Brown, ed. 1, 1: 48, ed. 2, 1: 54.

Corms 2-lobed; leaves 15–60, 15–40 cm. long, slender, erect, firm, bright green, usually black and shining at base, with usually pale membranaceous border, little (2–3 cm.) extended above sporangium level; stomata present; peripheral strands 4–6 cardinal, plus as many as 14 accessory groups; ligule subulate, triangular; sporangia oblong, 0.5–3 cm. long, marked by numerous brown spots; velum variable, from very narrow to covering half of sporangium; megaspores 280–440 μ in diameter, marked with low tubercles, frequently confluent into short low wrinkles; microspores frequently ashy-gray, 20–30 μ long, fine-spinulose.

Distribution: Illinois to Texas. Wet prairies.

Specimens examined: *Pfeiffer*, *Bush*, *Palmer*.

3. *Isoetes Butleri* Engelm. in Bot. Gaz. 3: 1. 1878. Gray, p. 61; Britton & Brown, ed. 1, 1: 48, ed. 2, 1: 54.

Corms 2-lobed; leaves 8–30, 8–15 cm. long, more slender and rigid than *I. melanopoda*, tapering to apex; stomata numerous; peripheral strands usually 4, sometimes more in number; ligule elongated, cordate at base; sporangium oblong, 6–7 mm. long, marked with brown lines; velum very narrow; megaspores variable, commonly 480–650 μ in diameter, marked with numerous tubercles, usually distinct, occasionally confluent; microspores 27–37 μ long, papillose.

Distribution: Tennessee, westward to Kansas and Oklahoma. Limestone barrens.

Specimens examined: *Eggert*, *Bush*, *Palmer*.

SALVINIACEAE

AZOLLA

1. *Azolla caroliniana* Willd. Sp. Pl. 5: 541. 1810. Gray, p. 50; Britton & Brown, ed. 1, 1: 35, ed. 2, 1: 38.

Plants floating on surface of water, often covering large areas, deltoid or triangular-ovate in outline, 6–25 mm. broad, pinnately branched; lobes ovate, lower lobe reddish, upper greenish with a reddish border; megaspores minutely granulate with three accessory corpuscles; masses of microspores armed with rigid septate processes.

Distribution: Lake Ontario to Florida, westward to Washington and California. On surface of still waters.

Specimens examined: *Eggert, Engelmann, Trelease, Bush, Mackenzie.*

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